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The Necessity of Integration of Flood Risk Reduction Strategies with Spatial Planning Decisions in Turkey, by Comparing Exemplary Practices in Developed Countries

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Abstract

In recent years, floods have obtained a predominant position among natural disasters worldwide, due to their rising number of occurrence and negative impacts. Flood and flash flood events affected many places adversely and caused serious human and material losses in Turkey. The search for a solution related to this problematic issue has become the starting point of the research. Noteworthy factors that increase the risk of flooding in Turkey include the effects of global climate change, increasing number of urban areas, changes in landscape, wrong land use decisions, spatial planning approaches disregarding natural thresholds and the phenomenon of natural risk. In this context, spatial planning approaches are needed to reinforce settlements against flooding disasters and ensure sustainability.

Keywords: *Flood risk, integrated flood risk management, water basin planning and management, risk-based spatial planning, sustainability.*

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In this study, international conferences and approaches of developed countries (United States, European Union and Switzerland) to reducing flood risk were investigated. In this context, this study describes existing legal-administrative structures and practices for the solution of problems caused by floods in Turkey and examines their relationship with spatial planning studies.

The objective of this study is to demonstrate that the key to success in all efforts to prevent damages to property caused by floods in Turkey is *"the need for ensuring integration of such efforts with spatial planning decisions at all scales",* by comparing exemplary practices in developed countries to those in Turkey. In this sense, suggestions are made in relation to the spatial planning regulations and to organizational structure based on the findings of the research in relation to the application in Turkey.

INTRODUCTION

Increasing Number of Floods in The World

The United Nations (UN) Office for Outer Space Affairs, the International Red Cross and Red Crescent Movement announced the *"2016 World Disaster Report"* to the public at a press conference held at the UN Office in Vienna. According to the report, in which disasters are described in two categories, i.e. *"natural"* and *"technological",* 371 natural and 203 technological disasters occurred worldwide in 2015. The number of deaths caused by 574 disasters worldwide was 32,550. According to the report, 410 people were killed and 6,768 people were injured as a result of disasters in Turkey in 2015. Among natural disasters, floods were in the first place with 154 occurrences, followed by storms in the second place with 114 occurrences, droughts in the third place, which increased by 38 percent, the climax in the last decade. The report emphasized that natural disasters were caused by climate change, and the number of people reportedly affected by natural disasters was noted to be about 108 million (World Disaster Report 2016 Published, 2016). According to the map of Munich Re, NatCatSERVICE (2018) (Figure 1), which shows the worldwide distribution of natural disasters that occurred in 2017, *"floods"* have a predominant share in terms of number of occurrences and number of deaths.

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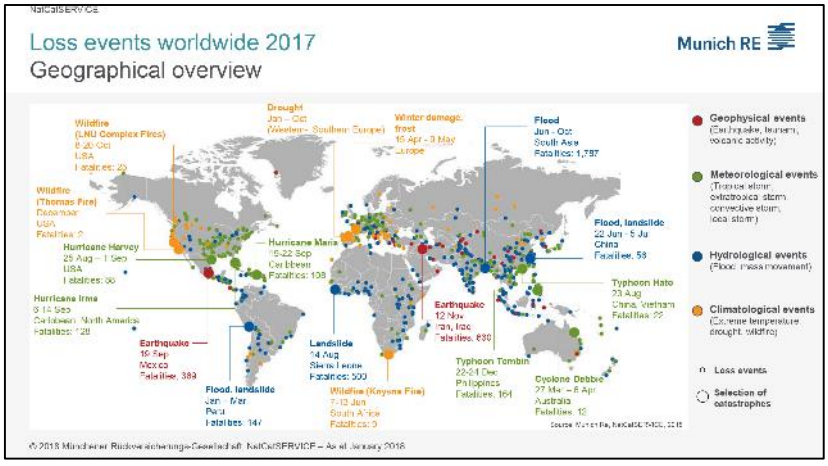

Figure 1. Loss events worldwide 2017, geographical overview. Reference: Munich Re, NatCatSERVICE, 2018.

It is stated that losses due to natural disasters increased in every cycle between the years 1980 and 2017, and floods accounted for 47% of loss events. 93% of all events were weather-related (contributing US$ 320bn). 2017 was the costliest year ever in terms of global weather disasters. Reported flood events are increasing over time (Faust, 2018).

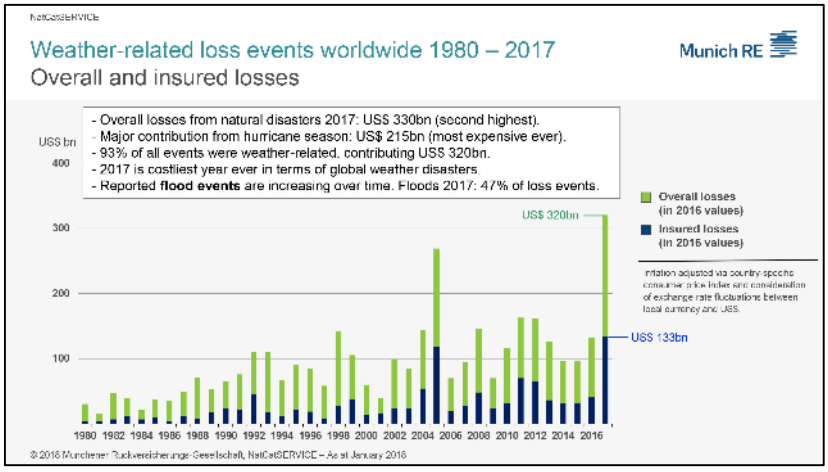

Figure 2. Weather-related loss events worldwide 1980-2017. Reference: Faust, 2018.

According to United Nations' resolution; 1990-2000 International Decade for Natural Disaster Reduction (IDNDR) were programmed to be the decade to reduce the effects of natural disasters in the World. During the decade, new strategies and principles were defined at the Yokohama Conference (1994) and International Strategy for Disaster Reduction (ISDR) was founded in 2000 as a new organ of UN to realize the strategies. ISDR organized the Kobe Conference in 2005, and as a result of the decisions taken during the conference; a new decade of activities (2005-2015) Hyogo Framework for Action (HFA) was projected (Balamir, 2007). Hyogo Framework Action Plan, which features a road map prepared for years between 2005-2015 and originated from United Nations' Reduction of Disaster Damages, creates a master framework for approaches to flood disaster issues. Hyogo

Framework Action Plan recognized by 168 United Nations member countries, targets to reduce social, economic and environmental losses and notably loss of life caused by disaster damages in world scale; emphasizing the importance of international cooperation. The importance of assessment and mapping of risk reduction strategies in an integrated sense was highlighted by providing integration with spatial planning within technical and corporate inter-capacities information sharing and cooperation. In this context, creation of National Platforms is important (Kuterdem, Akın & Nurlu, 2009). In addition, new concepts entered the literature through these developments, as *"risk management, disaster sensitive planning, contingency plan, mitigation, mitigation planning," etc.* (Kadıoğlu, 2012).

Figure 3. Flood Disaster in Louisiana, 2016 (left). Reference: URL 1.

Figure 4. Flood Disaster in Hiroshima, 2018 (right). Reference: URL 2.

Figure 5. Flood Disaster in Paris, 2016 (left). Reference: URL 3.

Figure 6. Flood Disaster in Switzerland 2018 (right). Reference: URL 4.

The Sendai Framework for Disaster Risk Reduction 2015-2030 is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action. It was endorsed by the UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR). The Sendai Framework is a 15-year, voluntary, non-binding agreement which recognizes that the State has the primary role to reduce disaster risk, but that responsibility should be shared with other stakeholders including local governments, the private sector and other stakeholders. It aims for the following outcome: The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries. The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA)

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2005-2015: Building the Resilience of Nations and Communities to Disasters (UNISDR, 2015).

Increasing Number of Floods in Turkey

According to the report of *"Meteorological Characteristic Natural Disasters in Turkey in 2017",* meteorological characteristic natural disasters observed in 2017 in Turkey primarily included storms (36%), heavy rains/floods (31%) and hails (16%). Turkey has a wide geography and various climate regions. Due to its geographical position and sensitivity to atmospheric conditions, meteorological and hydrological disasters, primarily storms, floods, droughts, hail and heavy snow, occur quite frequently, leading to considerable death and loss of property (Turkish State Meteorological Service, 2018).

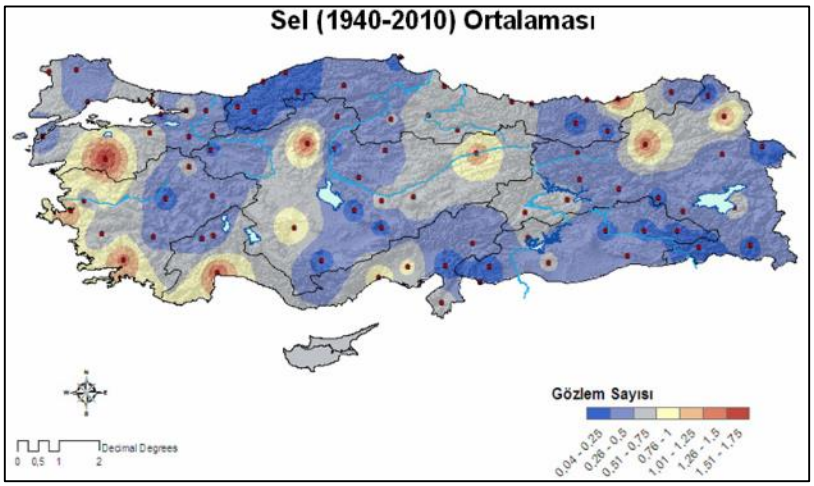

Figure 5. The Average of Floods-Heavy Rainfall Disasters Reported in Turkey between 1940 and 2010. Reference: Kadıoğlu, 2012, P. 89.

According to the *"Meteorological Characteristic Natural Disasters in Turkey-Floods"* data, all flood disasters which occurred in Turkey between 1940 and 2010 took place particularly between May and July. The sites which were affected the most from floods are situated in the Black Sea, Mediterranean and Western Anatolia regions. When the distribution of floods that occurred between 1940 and 2010 was examined, it was seen that summer months were in the first place with 39%, followed by spring months with 25% in the second place and autumn in the third place with 18%. Seasonal distributions may vary locally. In Turkey, particularly coastal areas, deltas and valleys are prone to flooding risk due to heavy rainfall. Although heavy rainfall is the trigger factor in flood disasters that may occur in the abovementioned areas, other factors such as geomorphologic structure, unplanned urbanization and construction of houses in flood beds also play an important role (Turkish State Meteorological Service, 2017).

The rural population accounted for 75% of the population of the Republic of Turkey in 1927 and then the Country entered into a rapid urbanization process, particularly after the 1950s. Industrialization and mechanization of agriculture process, which decreased the availability of agricultural jobs, triggered a migration from rural areas to big cities. The percentage of rural population, which fell to 65% in 1970, declined further to 47% in 1985 and in 2017, urban population accounts for 92.5% of Turkey's population, which is estimated to be 80 million 81 thousand 525 people (Turkish Statistical Institution).

Figure 6. Flood Disaster in Istanbul Ekspres Road, 2009 (left). Reference: URL 5.

Figure7. Flood Disaster in Silivri, Istanbul, 2009 (right). Reference: URL 6.

Figure 8. Flood Disaster in Edirne (historical bridge), 2015(left). Reference: URL 7.

Figure 9. Flood Disaster in Bodrum, 2015 (right). Reference: URL 8.

Figure 10. Flood Disaster in Rize, 2015 (left). Reference: URL 9.

Figure 11. Flood Disaster in Ordu, 2016 (right). Reference: URL 10.

There are 30 metropolitan cities, home to the majority of Turkey's population. During that rapid urbanization process which took place in a legal-administrative structure that lacked spatial planning legislation, segregation of duties and communication between institutions and organizations, etc., wrong land use decisions were taken under the pressure of intensive construction activity. The resulting built environment prevented the absorption of water by soil and lead to an increased surface flow coefficient. Combined with urban technical infrastructure deficiencies and the effects of climate change, these factors led to an increase in the number of flood disasters in urban areas as well as a rise in material and moral losses particularly in the recent years. Floods and river flooding disasters still occur in various geographical regions of Turkey.

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APPROACHES TO REDUCING FLOOD RISK ADOPTED WORLDWIDE BY DEVELOPED COUNTRIES

Main Approaches to Reducing Flood Risk in European Union Countries

"Water basins" stand out as priority and strategic units in planning and management to strike a balance between integrated *"conservation and use"* of natural resources on a regional scale and sustainable development in the European Union countries. The Member States, the European Parliament and the European Commission have reached a consensus on the idea that an integrated approach to water should be adopted in the future. The EU Water Framework Directive (EU Directive 2000/60/EC) entered into force on 22 November 2000 with a view to establishing a framework for integrated water management across Europe. EU Directive 2000/60/EC stipulates establishment of "*river basin management plans*" to ensure sustainable development, and establishes it as the most important key point to ensure integration of such plans with land use decisions. It is reported that river basin management plans are important tools in implementing sustainable development.

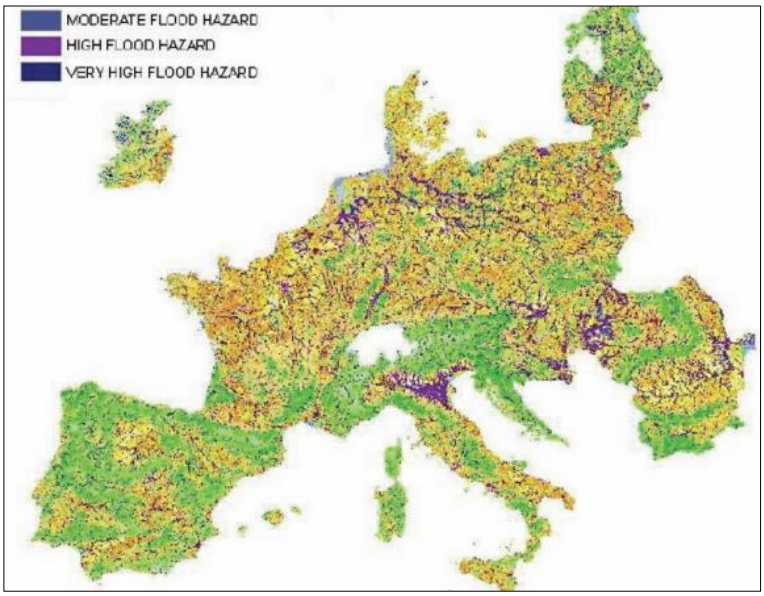

Figure 12. Overlay of the Corine land cover map and European flood hazard map. Reference: Martini & Loat (Ed.), 2007, P.149.

EU Directive 2007/60/EC of the European Parliament and of the Council on the Assessment and Management of Flood Risks, which is an extension of EU Directive 2000/60/EC and focuses on floods, was published in EU Official Journal and approved on 23 October 2007. The aim of that directive is to establish a framework for reducing negative effects of floods on human health, environment, cultural heritage and economic activities by evaluating and managing flood risk. Flood risk management is an integral part of

the integrated river basin management, so it is coordinated with the Flood Directive and the Water Framework Directive. The Flood Directive sets out the requirement for the EU Member States to develop a preliminary flood risk assessment, flood mapping (flood hazard maps & flood risk maps) and flood risk management plans. In this context, flood risk is described as the combination of the probability of a flood event and of the potential adverse consequences for human health, the environment, cultural heritage and economic activity associated with a flood event. Development of flood risk maps requires multi-layered and complex inquiries. Flood hazard maps show studies of flow velocity, water flow, water depth, water level and the flood extent, primarily the flood impact area. Flood risk management aims to reduce the likelihood of floods and their adverse impacts. Flood risk management focuses on taking precautions before natural risks turn into a disaster, development of early warning systems, etc. and the need to reinforce this process with *"disaster management"* studies. Another issue that has been agreed upon is the integration of flood risk management and disaster management studies with land use decisions and spatial planning activities.

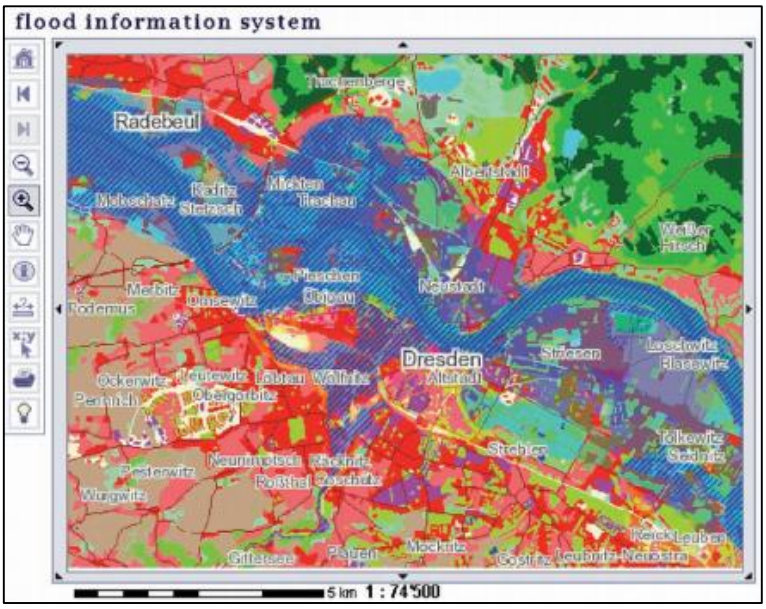

Figure 13. Combination of flood extension and land use map for the city of Dresden (ELLA Project) Reference: Martini & Loat (Ed.), 2007, P.154.

Each EU state devoted to implementing EU common principles revises its own legislation and implementation approaches. All EU member states are required to develop their spatial strategies and policies specific to the conditions of each basin of flood map studies and prepare works based on desired level of international co-operation. In this context, information is shared by publishing guides on good practices (Handbook on good practices for flood mapping in Europe, etc.) on the web site of the European Commission about Environment. Scientific research projects on

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flood risk in river basins in the EU, supported by EU funds are also important for sponsoring such studies (River Rhine Flood Information System, etc.). According to EU Directive 2007/60/EC on the assessment and management of flood risks, member states have to ensure that the flood hazard and flood risk maps are completed by 22 December 2013, flood risk management plans are completed by 22 December 2015, flood hazard and risk maps are reviewed, and if necessary updated by 22 December 2019 and every six years thereafter and flood risk management plans are reviewed by 22 December 2021.

Main Approaches to Reducing Flood Risk in The United States of America

The foundations of integrated management of water resources and water basin planning in the United States date back to the 1930s, and the first example is the Tennessee Valley Project. In addition to the solution of flood problems in the region, the Tennessee Valley Authority (TVA) which was established with a view to utilizing the region's water potential and energy production, carried out water basin planning studies and achieved socio-economic development on a regional scale. Today, although TVA continues to exist independently in an exceptional way, the Environmental Protection Agency (EPA) is responsible for planning and management of water resources on a basin scale throughout the USA, whereas Federal Emergency Management Agency (FEMA) is responsible for conducting studies to reduce flood risk. Within the scope of *"National Flood Insurance Program"*, FEMA conducts operations including raising awareness among all stakeholders, especially citizens, about flood risk and promoting insurance in regions subject to flood risk. In this context, it prepares flood risk maps, flood hazard maps, flood insurance maps, flood management plans, which also provide guidance to spatial planning activities, communicating with all stakeholders.

As indicated by FEMA official resources; by means of "Risk Matching, Assessment and Planning (Risk MAP), a flood hazard mapping program, FEMA identifies flood hazards to prevent flood disasters. Constituting the basis of National Flood Insurance Program (NFIP) regulations and flood insurance requirements, Flood Hazard Mapping is an important part of the National Flood Insurance Program (NFIP). FEMA maintains and updates data through Flood Insurance Rate Maps (FIRMs) and risk assessments. Statistics such as river flow, storm waves, hydrological analyses, precipitation and topography surveys: FEMA supports conscious planning and development practices to

identify flood risk in the Risk MAP project and mitigate the risk through identification, assessment and planning. In this context, it works with federal, state and local partners. Each Risk MAP flood risk project is tailored to the unique needs of each community. FEMA has also initiated the *"Coastal Flood Insurance Studies"* of the USA in order to prevent damages of disasters such as tsunamis, etc. that may occur in coastal settlements due to climate change. FEMA has been updating Flood Insurance Studies (FISs) and Flood Insurance Rate Maps (FIRMs) with Risk MAP studies for the USA and publishes new FIRMs in densely populated areas which have not been previously matched.

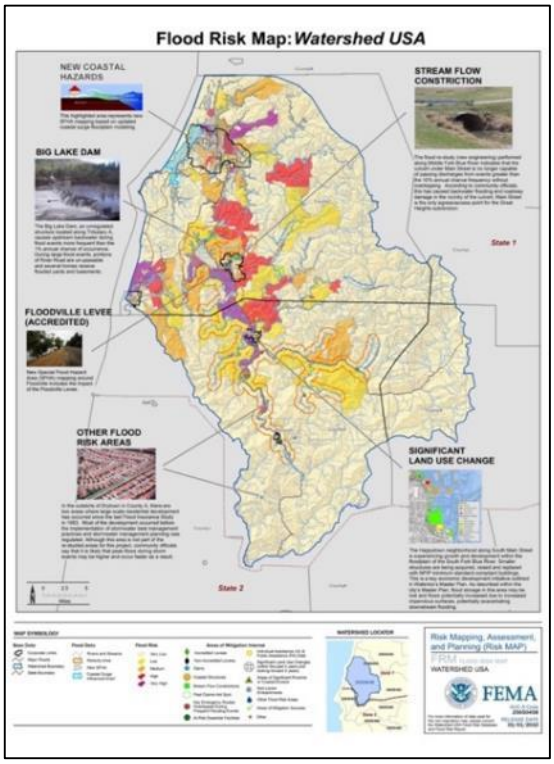

Figure 14. Flood Risk Map: Watershed USA. Reference: FEMA, 2018, P. 17.

Figure 14. An example of flood mapping products of FEMA in USA. Reference: URL 11.

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FEMA works with *"specific guidelines and standards"* to support the Risk MAP program. These guidelines and standards define the specific implementation of the statutory and regulatory requirements for NFIP flood risk analysis and mapping and also address the performance of flood risk projects, preparation of maps and related Risk MAP activities. Maps and datasets for flood risk describe hazard mitigation planning activities, in particular the risk and vulnerability assessment section of a hazard mitigation plan and information on development of risk-based strategies. They also help to guide land use and development decisions and take measures by highlighting areas of highest risk, areas where damage should be mitigated, and areas to be changed to prevent flood risk. As a matter of fact, the authors of spatial planning studies use these data to develop conservation plans, and studies of flood risk areas and take special decisions.

Main Approaches to Reducing Floods and Flood Risk in Switzerland

When the approaches in Switzerland, a Central European country that is not a member of the European Union, to reducing flood risk are examined, it is understood that the flood issues in Switzerland are mainly under the responsibility of the Federal Office for the Environment (FOEN). According to the references of FOEN, the Swiss government is responsible for protecting its people from natural hazards and ensuring property security. In Switzerland, damage caused by natural hazards is progressively increasing. Settlement areas are expanding and flood hazard areas are being used more intensely. In addition, global climate change significantly increases the risk of natural phenomena to turn into a hazard in Switzerland and its impacts. The figures for Switzerland as a whole show that one fifth of the settlement areas are facing natural hazards (mainly floods). In these areas, there are about 1.8 million people who face the risk of flooding. In Switzerland between 1972 and 2014, the total amount of damage caused by floods, landslides, erosion and mud flows was 320 million Swiss francs. Damages that were caused by natural hazards such as floods, mud flows, landslides, erosion and avalanche in Switzerland since 1972 provide considerable information about protection from natural hazards in this context. These experiences suggest that Switzerland has to live with these natural phenomena due to its natural location. The analyses of the experiences in Switzerland as well as systematic assessments and all experiences provide the basis for the need for an *"integrated risk management"* and today the principles of *"integrated risk management"* have been adopted for protection from natural hazards in Switzerland.

Integrated risk management is defined as a combination of methods and criteria. It involves obtaining information on risks, assessment and approval/acceptability on a periodic basis. Thus, priorities and action areas are developed. The development of risks is directed by appropriate criteria and future risks can be prevented. It is emphasized that a successful risk management requires an intensive "*risk dialogue*" between actors. In spatial planning criteria, co-operation of public and private actors in this context becomes much more important. Continuous monitoring of this process allows early recognition of general changes in hazards and of hazard situations, so it is aimed to mitigate damage through early warning, alarm and information systems. While completing basic studies on the National Hazard and Risk Assessments, Federal Office for the Environment (FOEN) revises them against constantly intensifying spatial use, *"risk analyses"* are made by superimposing flood hazards to spatial uses.

Protection from natural hazards in Switzerland is defined as a holistic task in which all participants provide their own inputs. The most important actors responsible for the protection from natural hazards are:

1. Insurance industry: To clarify the insurance conditions by providing information and counselling and insure potential losses.

2. Citizens / Respondents: To take responsibility for security of one's own property, be prepared for emergency situations and for acting appropriately in the event of a disaster.

3. Public institutions (across Swiss federation, cantons and districts): Public duties; in Switzerland, in the case of natural hazards, districts (in general) and cantons are accountable. The Swiss government (federation) assumes a strategic orientation role and supports cantons in terms of finance and expertise.

Apart from these, there are also other actors concerning protection against natural hazards. For example, *"planners and engineers"* are responsible for informing these risks in the framework of their areas of responsibility and for providing the criteria that reduce the risks.

Spatial planning studies in Switzerland govern the development and use of space. Care is also taken to avoid additional risk caused by new constructions in risky areas through superimposition and transfer of hazard maps and risk maps to spatial planning studies. In practice, implementation of *"risk based spatial planning"* requires combined use of various tools. Hazard maps are

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transferred to navigational spatial and land-use plans (Kantonal Richtplan). In this context, construction status is finalized by building permits. Building insurers provide consultancy services in various cantons to determine the criteria for protection. Cantonal Guiding Plans (Kantonal Richtplan) are the core tool of spatial planning. The Cantonal Guiding Plan prepared by the cantons for protection against natural hazards describes the guiding principles on how to live with these natural hazards, how to work on, coordinate and temporally organize hazard- and risk-based studies. A hazard- and risk-based study is a binding enforcement tool for implementation in cantons and districts (Gemeinde).

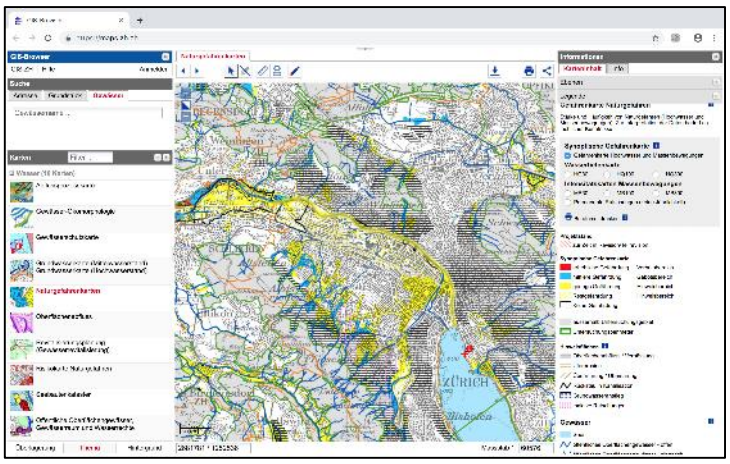

Figure 15. An example of Flood Hazard Map of Canton Zurich. Reference: URL 12.

Land-use and building and zoning regulations set forth in the Spatial Use Plan (Nutzungsplanung), show, on a land plot basis, the contents of hazard maps for districts and their results to land owners, and are binding. Hazard maps are divided into the zones.

- Red zones are the most dangerous areas where the construction of new structures and of existing ones is not permitted.

- In blues zones, construction is permitted subject to certain use restrictions (moderately risky areas).

- In yellow and yellow-white shaded zones (areas of minor or residual risk), permit is granted with structural precautions by which increases risk due to intensity of existing use is prevented.

When the above zoning legend is examined, risk zone of a site is determined by seeking an answer to the question *"at what depth and what velocity is that site affected by the flood"*, not only to the question *"whether that site will be affected by a flood"*. In the case of building permits, the cantons and districts inquire whether the request for building permit complies with the laws and

regulations of that district. In this context, the conditions for protection against natural hazards are also sought during evaluation of applications for building permits.

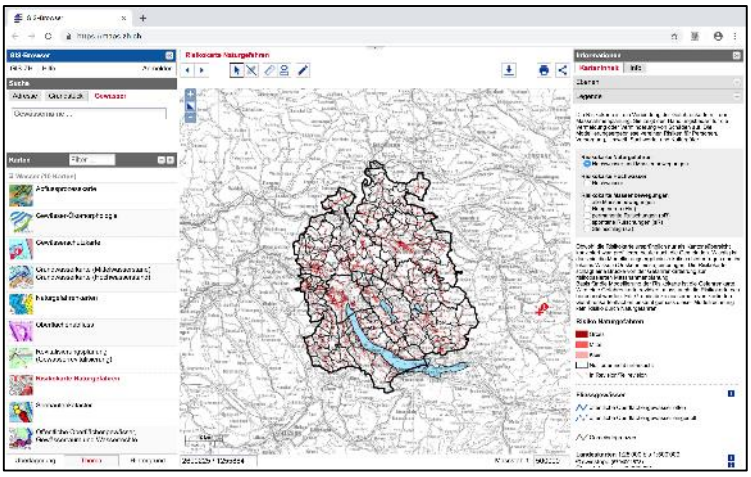

Figure 16. An example of Flood Risk Map of Canton Zurich. Reference: URL 12.

FOEN produces a variety of interactive maps on different natural hazards. Interactive Maps include geographical information models for natural hazards. All of these maps can be accessed from the Web-GIS page of FOEN. Hazard maps, intensity maps and hazard content maps are prepared by the cantons and can be seen at the cantons' geoports. It is the common duty of the Federal Office of Topography (Swisstopo), the Federal Office of Statistics and the Federal Office for Spatial Development to prepare basic documents on spatial uses and population development.

APPROACHES TO REDUCING FLOOD RISK IN TURKEY

Existing Legal-Administrative Structure in Turkey

Concerning the legislation on floods in Turkey, Law No. 4373 on Protection Against Flood and Inundation (1943) that entered into force upon its publication in the Official Gazette on 21.01.1943 is the oldest and most effective law. However, various institutions have been commissioned regarding floods by several laws and regulations, including Law No. 6200 on the Organization and Duties of the General Directorate of State Hydraulic Works (1953), Law No 3621 on the Shores (1990), Decree No. 645 on the Organization and Duties of the Turkish Republic Ministry of Forestry and Water Affairs (2011), Decree No. 644 on the Organization and Duties of the Turkish Republic Ministry of Environment and Urbanization (2011), Law No. 3194 on Reconstruction (1985), Law No. 5216 on Metropolitan Municipality (2004), etc. This has led to confusion of authorities and uncoordinated working.

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In practice, efforts to reduce the flood risk have been carried out predominantly by the General Directorate of State Hydraulic Works associated with the State Planning Organization. Established in 1954 with the Law No. 6200, the State Hydraulic Works is basically the oldest authorized establishment in the planning and management of water resources. By virtue of the authorization vested by the Law No. 6223 (2011) the Council of Ministers decided on 29/6/2011 to amend certain laws and statutory decrees due to establishment of the Turkish Republic Ministry of Forestry and Water Affairs. The General Directorate of State Hydraulic Works, the oldest and long-established institution dealing with hydraulic works carries out its activities under the Turkish Republic Ministry of Forestry and Water Affairs and is responsible for planning, management, development and operation of water resources. However, with the Metropolitan Municipality Law No. 5216, the rehabilitation of streams in metropolitan municipalities has been described as the duty, authority and responsibility of the metropolitan municipality.

Awareness on flood disaster and climate change in Turkey can be said to have increased especially after serious losses were suffered during the flash flood and river flooding events in Istanbul, Antalya, etc. in 2009. From that date onwards, promising efforts have been initiated more rapidly on prevention of flood disaster, disaster management and post-disaster issues. As a matter of fact, the Prime Ministry Circular (2010) No. 2010/5 and issue 27499 published in the Official Gazette on 20 February 2010 on the importance of the matter asking for urgent cooperation states that: *"Considering the differences in the quantity and intensity of rainfall due to global climate change and flood disasters caused by the floods in the recent years, in order to prevent potential future floods, river and stream beds should be rehabilitated in a short period of time". In this context, responsibilities are given to the public institutions and organizations regarding the rehabilitation of stream beds and waterways, particularly to the General Directorate of State Hydraulic Works (DSI),* Turkish Republic *Ministry of Environment and Forestry, Governorships, Metropolitan Municipalities pursuant to the Metropolitan Municipality Law No. 5216".*

The 10th Development Plan for (2014-2018) which guides planning studies at the country scale says; *"As a consequence of climate change, the frequency of disasters has increased, with effects reaching enormous levels. Although progress has been made in disaster management and pre-disaster risk mitigation measures in our country, there is still a need to prepare integrated disaster hazard and risk maps and to include them in settlement planning*

and zoning planning processes" (Turkish Republic Ministry of Development, 2013). Nationwide Disaster Response Plan of Turkey prepared in 2014 covers ministries, institutions and organizations, private organizations, NGOs and the community to be assigned duties in case of disasters and emergencies of any type and scale in Turkey. Founded in 2009 under the auspices of the Prime Ministry Disaster and Emergency Management Authority (AFAD) is one of the most active units specialized in all kinds of disasters. And the legal and administrative structure for flood disaster has begun to be revised (AFAD, 2014). Examples of legal arrangements include Law No. 5902 the establishment and duties of the Disaster and Emergency Management Authority (2009), Law No. 6305 (2012) on Disaster Insurance, Law No. 6306 on Transformation of Areas at Risk of Natural Disaster (2012) that entered into force upon its publication in the Official Gazette dated 31/5/2012, the Regulation on Disaster and Emergency Intervention Services (2013), published on 18/12/2013, Prime Ministry Circular No. 2006/27 on Stream Beds and Floods (2006) published in the Official Gazette on 9 September 2006 and Prime Ministry Circular No. 2010/5 on the Rehabilitation of River and Stream Beds (2010) published in the Official Gazette on 20 February 2010.

As an important and positive development in the process of harmonization with the EU, *"the Regulation on Protection of Water Basin and Preparation of Management Plans (2012)"* was adopted and published in the Official Gazette on 17 October 2012. The purpose of this Regulation is to set out procedures and principles on protection of surface waters and ground waters with a holistic approach in terms of physical, chemical and ecological quality and on preparation of water basin management plans. This Regulation covers the principles and procedures on protection of water basins with surface water and ground water resources, excluding seas and including coastal waters, and on preparation of their management plans. The *"National Water Basin Management Strategy (2014)"* was adopted in the Official Gazette on 4 July 2014. Under the Water Basin Management Plan, an important effort concerning floods is establishment of a *"Central Flood Management Committee"* and *"Provincial Flood Management Delegations"* within the scope of *"Flood and Inundation Strategy Action Plan"* to be prepared by 5 General Directorates as per the Decision of the Flood Coordination Board made by the Turkish Republic Ministry of Forestry and Water Affairs in 2012. *"The Regulation on Preparation, Implementation and Monitoring of Flood Management Plans (2016)"* was published in the Official Gazette on 12 May 2016 and entered into force. The purpose of that Regulation is to stipulate procedures and principles of

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assessment of flood risks at water basin scale and preparation, implementation and monitoring of flood management plans to reduce the adverse impacts of floods on human health, soil, environment, nature assets, natural protected areas, special environmental protection zones, cultural heritage, social and economic activities. "*The Flood Management Branch Directorate*", an entity associated with the Turkish Republic Ministry of Forestry and Water Affairs was also established in 2016.

In the Official Gazette No. 30474 dated July 10, 2018, it was decided to combine the Turkish Republic Ministry of Food, Agriculture and Farming and the Turkish Republic Ministry of Forestry and Water Affairs with the Decree of the Presidential Organization (No:1). All directorates within the Forest and Water Works are continuing their activities under the newly established Turkish Republic Ministry of Agriculture and Forestry.

Flood Management Plans in Turkey

Under the auspices of the Turkish Republic Ministry of Forestry and Water Affairs, the General Directorate of State Hydraulic Works has started to the studies for the establishment of Water Basin Management Plans that encompass harmonization with EU Water Framework Directive. The studies on the preparation of Water Basin Master Plans, which will provide a technical basis for the studies aforementioned, are conducted by the Directorate General of the State Hydraulic Works. The studies on the preparation of a "*Water Basin Master Plan Report*" for 25 water basins in Turkey were started in 2010. Another project in the process of harmonization with EU is *"EU Twinning Project on Capacity Building to Implement Flood Directive"* started in 2012. This project was prepared for Western Black Sea pilot basin and was completed in 2014. As a first example, the *"Preparation of Flood Management Plan"* was started for Yeşilirmak Water Basin in 2013. *"Flood Management Plan for Yeşilirmak Water Basin"* was completed by the Turkish Republic Ministry of Forestry and Water Affairs, General Directorate of Water Management in 2015. The second project entitled *"Preparation of Flood Management Plan for Antalya Water Basin"* was started in 2014 and it was completed by the Turkish Republic Ministry of Forestry and Water Affairs, General Directorate of Water Management in 2016. Within the scope of this project, flood risk maps aligned with 3 different (50-year (Q50), 100-year (Q100) and 500-year (Q500)) recurrent dams have been prepared in the direction of flood hazard maps, where the number of people affected, level of economic activity, critical facilities, possible economic damages and environmental damages are determined.

Figure 17. The Water Basins of Turkey. Reference: The General Directorate of State Hydraulic Works, 2017, P.43.

The provisions of the Regulation on Preparation, Implementation and Monitoring of Flood Management Plans are executed by the Turkish Republic Ministry of Agriculture and Forestry. The Regulation covers procedures and principles of preparation, implementation and monitoring of flood management plans. Flood management plans describe participatory cooperation processes on a water basin scale and regional scale in line with water basin management plans. The basic principles of Flood Management Plans are as follows: A Flood Management Plan;

a) serves as a guide to mitigate any damage that may arise from floods in a water basin,

b) is based on flood hazard maps and flood risk maps,

c) specifies the measures to be taken to reduce the risk,

d) identifies the responsible institutions.

In this context, responsibilities regarding Flood Management Plans in Turkey are defined as follows.

- Republic of Turkey, the Ministry of Agriculture and Forestry (General Directorate of Water Management) is responsible for the preparation, follow-up and coordination of Flood Management Plans as required.

- Water Basin Management Committees (under the chairmanship of the Governor acting as a Water Basin Coordinator) provincial governors and district governors in the Basin are responsible for conducting and reporting Flood Management Plans.

- Respective institutions and organizations (such as regional and provincial directorates of Ministries, local administrations) legally authorized and given responsibility for implementing the measures contained in the plan are responsible for the implementation of Flood Management Plans. Local

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administrations are obliged to prepare development plans, make disaster planning and carry out emergency aid services. In addition, the Metropolitan Municipalities are obliged to perform rehabilitation of the streams within their borders.

- Prime Ministry, Directorate of Disaster and Emergency (AFAD) is a leading institution with coordination duties during and after floods because of its responsibility to respond to floods and deal with the needs of disaster victims immediately.

Flood Management Plan for Yeşilırmak Water Basin (2015): Evaluation of Samsun Case

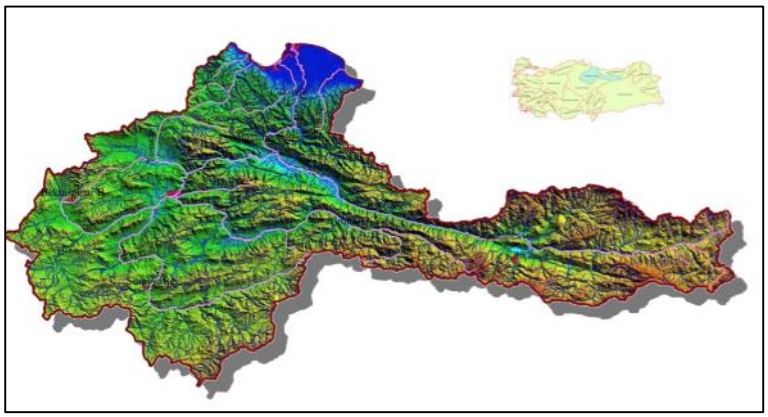

Figure 18. Yeşilırmak Water Basin Reference: Turkish Republic Ministry of Forestry and Water Affairs, 2015.

Yeşilırmak water basin, one of Turkey's 25 water basins, is located in the Black Sea Region of Turkey and is discharged into to the Black Sea. Yeşilırmak water basin contains the 3rd biggest rain area (39,628 sqm) in Turkey and also covers %5 of Turkey's surface area. %12 of water basin's area is constituted by the Samsun province. The identified risky areas were primarily located in Yeşilırmak water basin. According to surveys, the average total number of people expected to be affected per year in Yeşilırmak water basin is approximately 1,240 persons. Samsun is the place where the number of people expected to be affected by flood (Q500) is highest in Yeşilırmak water basin (Turkish Republic Ministry of Forestry and Water Affairs, 2015).

Figure 19. Flood Disaster in Samsun Canik District-TOKI Houses, 2012. Reference: URL 13.

Figure 20. Flood Disaster in Samsun Lovelet-Shopping Mall, 2012. Reference: Yılmaz, 2012.

The heavy rain in 2012 caused a casualty and big damage in Samsun. The overflow of the Mert River in Canik district provoked a great disaster. 13 people lost their lives during the flood that happened at the night of July 3th, 2012 in Canik district. Five of those casualties took place at the basement floors of Turkish Mass Housing Administration (TOKI). Following that, the Municipality removed the legal permission to reside in basements in this area (URL13). The shopping mall at Samsun's Canik valley, which was opened in June 8th, 2012, namely the Lovelet Shopping Mall was submerged into water. The mall became the victim of a wrong decision in a period of shorter than a month; constructing the mall on a river basin that was rehabilitated through drilling of the mountain (Yılmaz, 2012).

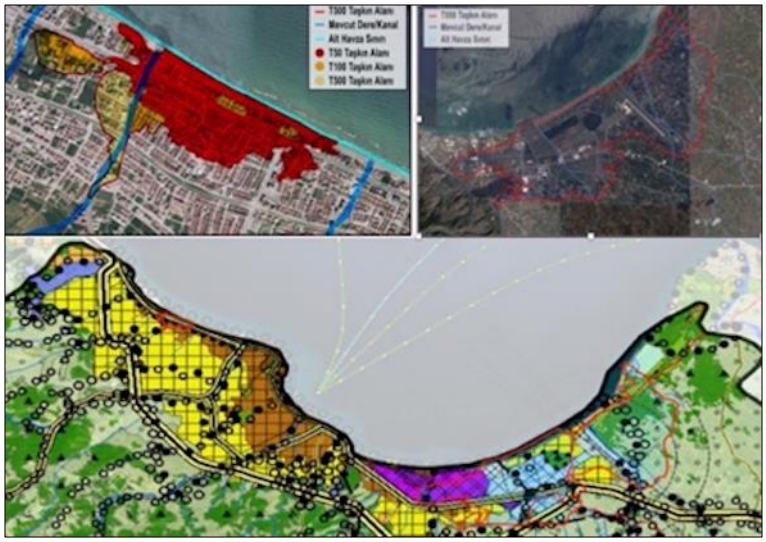

Figure 21. Areas exposed to flood risk (Q500) in Samsun as shown in the Yeşilırmak Flood Management Plan (Turkish Republic Ministry of Forestry and Water Affairs, 2015) overlapped with Satellite Images of Samsun Nord-west part (left), with Satellite Images of Samsun Nord-east part (right) and 1/100 000 scale Samsun-Çorum-Tokat Environmental Plan (Turkish Republic Ministry of Environment and Urbanization, 2016). Reference: Valiev, 2017.

[1]"Integrated Watershed Management in Turkey" has been studied at the Mimar Sinan Fine Arts University Master Programme, Urban Planning Studio course, in the 2016-2017 academic year. In the scope of the course, the relationship between flood risk maps and land use decisions in Samsun were investigated by Valiev (Figure21). After the first findings of the master studio studies, further research has been carried on land use and flood management plan decisions for Samsun by this study (Figure 22).

When the flood risk maps prepared for Samsun province within the scope of the Yeşilirmak Water Basin Flood Management Plan Report (Turkish Republic Ministry of Forestry and Water Affairs, 2015) are examined in detail, it can be observed that there are streams in Samsun, which is divided into 5 zones (A, B (B1-B2), C and D) (Figure 22). In this context, when we examine the 1/100 000 scale Samsun-Çorum-Tokat Environmental Plan (Turkish Republic Ministry of Environment and Urbanization, 2016), including high-scale spatial strategic plan decisions on the integration of these areas identified as flood hazard areas in Samsun province with spatial plans, it is observed that there are

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main decisions for organized industrial areas, residential areas, new development areas, natural conservation areas, marina area, and also airport area, etc. In this context, revision of land use decisions to reduce the negative effects of possible floods is required in Samsun.

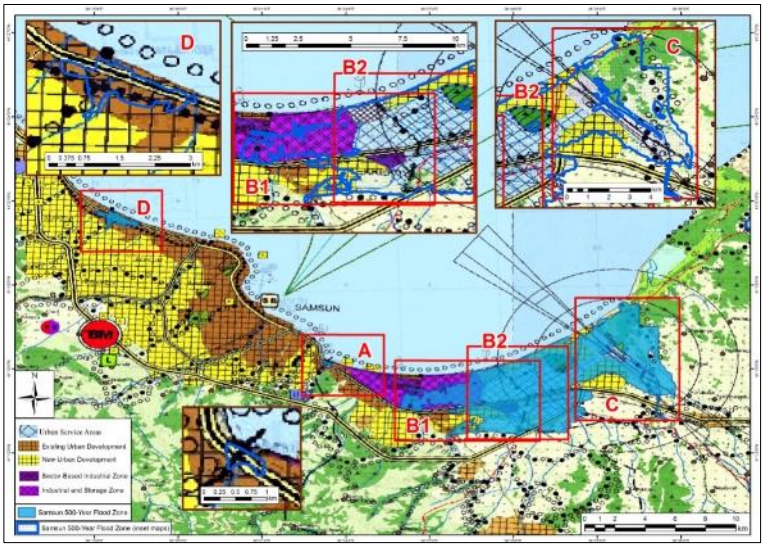

Figure 22. Areas exposed to flood risk (Q500) in Samsun as shown in the Flood Management Plan for Yeşilırmak Water Basin (Turkish Republic Ministry of Forestry and Water Affairs, 2015) overlapped with 1/100 000 scale Samsun-Çorum-Tokat Environmental Plan (Turkish Republic Ministry of Environment and Urbanization, 2016).

Flood Management Plan for Antalya Water Basin (2016): Evaluation of Manavgat River Case

Antalya water basin is located in the Mediterranean region of Turkey and discharged into the Mediterranean Sea. The water basin contains a rain area of 19,577 sqm and covers %2.5 of Turkey's surface area Antalya, the largest city of the water basin, is also the most important international touristic area of Turkey. Flood risky areas were identified primarily in Antalya water basin. Manavgat and Düden rivers are the places where the number of people expected to be affected by flood (Q500) is highest in Antalya water basin. The estimated total number of people to be affected during the flood recurrence periods is 72,467 at Antalya Basin's investigated river zones. When evaluated in scale of affected population from the flood (Q500); riskiest areas concentrate around Düden river (18,413 people) and Manavgat river (43,958 people) (Figure 24). In the meantime, Manavgat river has a special place in terms of the scale of expected amount of annual average damage, which is approximately 25 million Turkish Liras (Figure 25) (Turkish Republic Ministry of Forestry and Water Affairs, 2016).

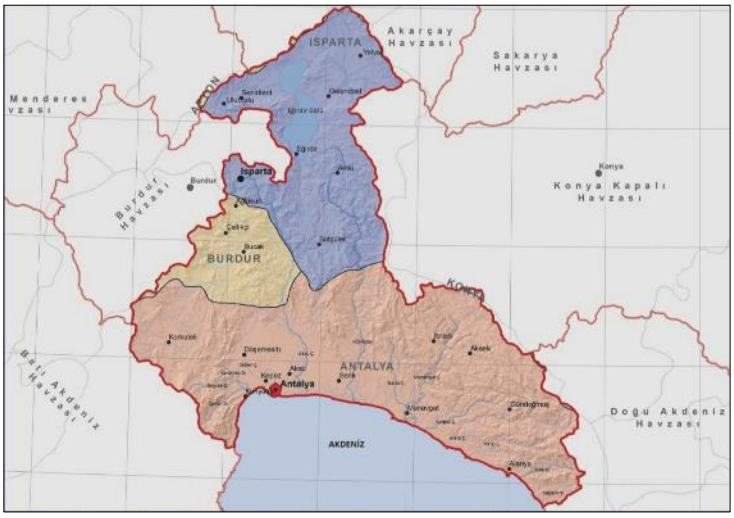

Figure 23. Antalya Water Basin. Reference: Turkish Republic Ministry of Forestry and Water Affairs, 2016, P. 2-2.

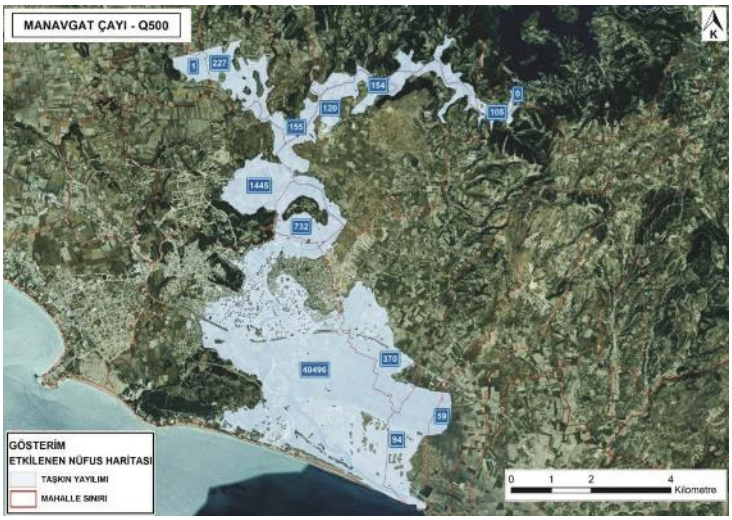

Figure 24. Affected Population (Q500) for Manavgat River by flood (Q500) Reference: Turkish Republic Ministry of Forestry and Water Affairs, 2016, P. 4-40.

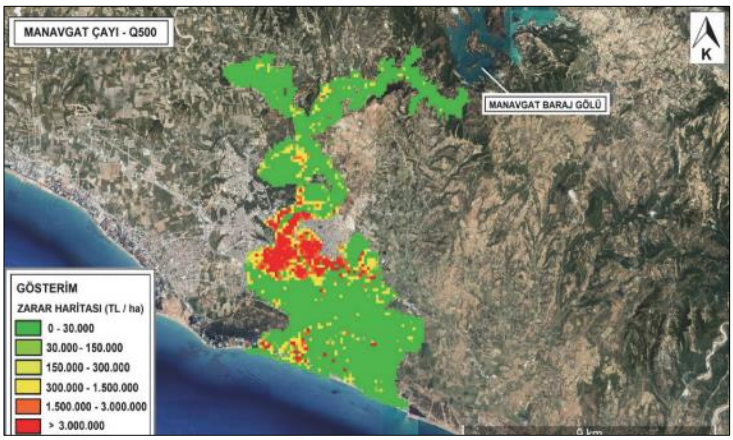

Figure 25. Annual Damage Map for Manavgat River by flood (Q500). Reference: Turkish Republic Ministry of Forestry and Water Affairs, 2016, P. 4-38.

In this region, floods can be experienced nowadays and they cause damage in rural and urban areas in Manavgat.

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Photograph 26. Flood Disaster in Manavgat, 2017. Reference: URL14. (left)

Photograph 27. Flood Disaster in the Tyche Temple in Side, 2014. Reference: URL 15. (right)

The flood risk areas of Manavgat river as shown in the Flood Management Plan for Antalya Water Basin (Turkish Republic Ministry of Forestry and Water Affairs, 2016) and the 1/100 000 scale Environmental Plan for Antalya-Burdur-Isparta (Turkish Republic Ministry of Environment and Urbanization, 2015) are laid together in this study (Figure 28). When we examine the 1/100 000 scale Antalya-Burdur-Isparta Environmental Plan decisions, including high-scale spatial strategic plan decisions on the integration of these areas identified as flood hazard areas of Manavgat river with spatial plans, it is observed that there are decisions for residential areas, tourism-related housing areas, urban development areas, agricultural areas and also important natural, historical and cultural conservation areas, etc. In this context, the spatial planning approaches that take flood risk into consideration are needed in Manavgat.

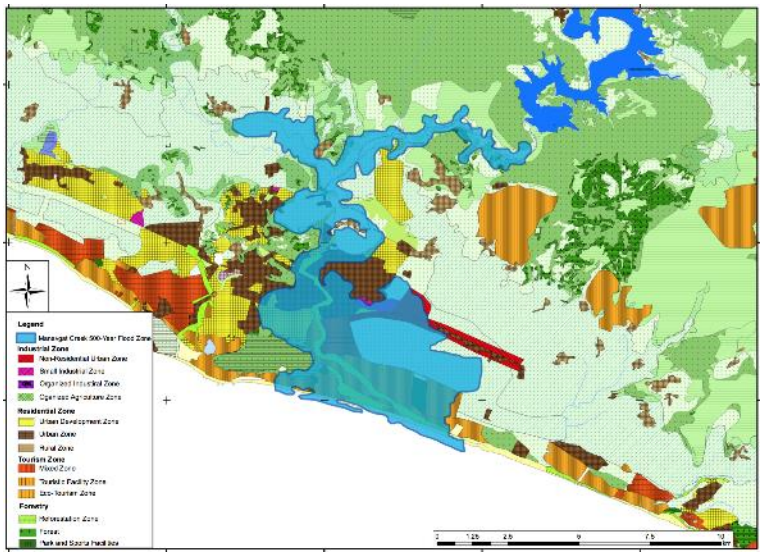

Figure 28. Areas exposed to flood risk (Q500) in Manavgat as shown in the Flood Management Plan for Antalya Water Basin (Turkish Republic Ministry of Forestry and Water Affairs, 2016) overlapped with 1/100 000 scale Antalya - Burdur - Isparta Environmental Plan (Turkish Republic Ministry of Environment and Urbanization, 2015).

Local administrations, primarily the Turkish Republic Ministry of Agriculture and Forestry and the Turkish Republic Ministry of Environment and Urbanization and also local governments should evaluate the results together by superimposing these studies with flood hazard and flood risk maps determined by the flood management plan. Flood hazard maps, flood risk maps and flood management plans should be integrated with regional spatial plans (1/100 000 scale environmental plans, water basin management plans etc.), local master building plans (1/5000

scale) and implementation development plans (1/1000 scale) at all scales.

CONCLUSION

The primary reason for the extreme losses suffered during the recent floods in Turkey is the wrong decisions on land-use. However, painful experiences have led to raised awareness on flood risk in Turkey, and as a result improved sensitivity on a national scale. Additionally, studies on fighting global climate change led by the United Nations and harmonization process with the European Union are positive developments that made Turkish institutions and organizations revise their legal and administrative structures regarding floods.

The Turkish Republic Ministry of Agriculture and Forestry works on *"flood management plans"* in line with the development of water basin management plans for reducing flood risk. Flood management plans should be expanded to cover the entire Country. It is understood that studies on flood hazard maps, flood risk maps and flood management plans have been carried out to reduce flood risk, and those studies place emphasis in particular on the need to correlate those studies with spatial planning studies. The Turkish Republic Ministry of Agriculture and Forestry should produce interactive GIS-maps and guidance on flood risk and flood hazards and this database should be accessible.

An *"integrated flood risk management process"* should be started in cooperation with the respective local administrations, local people, including also, the Turkish Republic Ministry of Agriculture and Forestry and the Turkish Republic Ministry of Environment and Urbanization. In the studies regarding planning of stream beds, long-term flood hazard and flood risk calculations should be taken into account and integrated into spatial plans. In this context, it is necessary to integrate of flood risk strategies with spatial planning decisions and also to revise all spatial plan decisions starting from upper scale national and regional plans to lower scale development plans.

As a matter of fact, Spatial Plans Construction Regulation published in the Official Gazette on June 4, 2014, prepared on the basis of article 5, 8 and 44 of Construction Law no. 3194 dated 3/5/1985 and article 2 of the Decree Law no. 644 on the Organization and Duties of the Ministry of Environment and Urbanization dated 29/6/2011 requires integration of all studies related to *"natural disasters"* and hence, the analyses of flood risk, risk management and mitigation plans, if any, with development

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plans. In this regard, local administrations have several responsibilities with regard to the planning processes, including raising awareness on flood risk among citizens. Preparation of "*risk-based spatial plans"* in flood disaster areas, as further defined in the Spatial Plans Construction Regulation, is extremely important and awareness should be raised among local people and administrators living in disaster areas, and actions should be taken through dialogue and cooperation in transparent processes. In light of these information, insurance and evacuation maps for flood risky areas should also be prepared.

The legal-administrative infrastructure has begun to be built in Turkey, which is a positive step in this regard. With effective urban planning approaches, irregular development can be prevented by foresting risky areas and stream beds, planning those sites as open spaces in accordance with the resolutions on ecological corridors and at the same time the negative effects of flood disaster should be reduced. "*High expropriation cost"* and *"reconciliation"* are the main long-term and challenging issues that need to be resolved with regard to rehabilitation of the areas exposed to flood risk in densely housed urban areas.

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Resume

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